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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/873,345	09/21/2001	Isaac Liu Chuang	AM9-99-0152	5183

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EXAMINER

DO, CHAT C

ART UNIT PAPER NUMBER

2124

DATE MAILED: 10/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/873,345	Applicant(s) CHUANG ET AL.	
	Examiner Chat C. Do	Art Unit 2124	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 September 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) 1-7 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 8-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>9/21/01</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This communication is responsive to Amendment filed 09/17/2004.
2. Claims 1-25 are pending in this application. Claims 1, 8, 14, and 20 are independent claims. In Amendment, claims 8-25 are elected due to restriction/election requirement. This office action is made non-final.

Election/Restrictions

3. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-7, drawn to a method for encoding or decoding a block of quantum data by removing trailing eigenstates, classified in class 708, subclass 200.
 - II. Claims 8-25, drawn to a method for compressing a block of quantum data by projecting a block quantum state, classified in class 708, subclass 203.

The inventions are distinct, each from the other because of the following reasons:

4. Inventions of Group I and Group II are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions, Group I of claims 1-7 is drawn to a method for encoding/decoding by removing trailing eigenstates and Group II of claims 8-25 is drawn to a method for compressing by projecting quantum state into typical subspace.

Art Unit: 2124

5. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

6. Applicant's election without traverse of Group II, claims 8-25, in the reply filed on 09/17/2004 is acknowledged.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 8-25 are rejected under 35 U.S.C. 102(b) as being anticipated by Isaac et al. ("Reversible Arithmetic Coding for Quantum Data Compression").

Re claim 8, Isaac et al. disclose a method for block compression of quantum information (abstract) comprising: projecting a block quantum state into a typical subspace comprising a plurality of eigenstates (abstract lines 3-5); encoding subspace using an encoder (abstract lines 10-14); and decoding subspace using a decoder (abstract lines 10-14).

Re claim 9, Isaac et al. further disclose generating block quantum state using a quantum memoryless Bernoulli source (abstract lines 1-2).

Re claim 10, Isaac et al. further disclose projecting of block quantum state into typical subspace comprises: analyzing a plurality of eigenvalues contained in a density

Art Unit: 2124

matrix associated with block quantum state; determining a plurality of largest eigenvalues; spanning subspace, wherein eigenstates are associated with largest eigenvalues to produce a spanned subspace; and projecting block quantum state into spanned subspace, to produce a projected block quantum state that lies in a low dimensional typical subspace (abstract and right column page 1104 second paragraph).

Re claim 11, Isaac et al. further disclose encoder and decoder are quantum-mechanical inverses of each other; and decoding is achieved by performing encoding in reverse (abstract lines 10-14).

Re claim 12, Isaac et al. further disclose encoding comprises using a fixed-rate quantum Shannon-Fano code to compress projected block quantum state, wherein compression occurs at a per symbol code rate that is slightly higher than a von Neumann entropy limit (abstract and right column page 1104 third paragraph).

Re claim 13, Isaac et al. further disclose encoding comprises: creating a representation quantum Shannon-Fano code as a plurality of quantum arithmetic codes; and using plurality of quantum arithmetic codes to compress subspace containing projected block quantum state (abstract and right column page 1104 fourth paragraph).

Re claim 14, it has same limitations cited in claim 8. Thus, claim 14 is also rejected under the same rationale as cited in the rejection of rejected claim 8.

Re claim 15, it has same limitations cited in claim 9. Thus, claim 15 is also rejected under the same rationale as cited in the rejection of rejected claim 9.

Re claim 16, it has same limitations cited in claim 10. Thus, claim 16 is also rejected under the same rationale as cited in the rejection of rejected claim 10.

Art Unit: 2124

Re claim 17, it has same limitations cited in claim 11. Thus, claim 17 is also rejected under the same rationale as cited in the rejection of rejected claim 11.

Re claim 18, it has same limitations cited in claim 12. Thus, claim 18 is also rejected under the same rationale as cited in the rejection of rejected claim 12.

Re claim 19, it has same limitations cited in claim 13. Thus, claim 19 is also rejected under the same rationale as cited in the rejection of rejected claim 13.

Re claim 20, it is a program storage device claim of claim 8. Thus, claim 20 is also rejected under the same rationale as cited in the rejection of rejected claim 8.

Re claim 21, it is a program storage device claim of claim 9. Thus, claim 21 is also rejected under the same rationale as cited in the rejection of rejected claim 9.

Re claim 22, it is a program storage device claim of claim 10. Thus, claim 22 is also rejected under the same rationale as cited in the rejection of rejected claim 10.

Re claim 23, it is a program storage device claim of claim 11. Thus, claim 23 is also rejected under the same rationale as cited in the rejection of rejected claim 11.

Re claim 24, it is a program storage device claim of claim 12. Thus, claim 24 is also rejected under the same rationale as cited in the rejection of rejected claim 12.

Re claim 25, it is a program storage device claim of claim 13. Thus, claim 25 is also rejected under the same rationale as cited in the rejection of rejected claim 13.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Art Unit: 2124

- a. U.S. Patent No. 4,568,912 to Kitamura et al. disclose a method and system for translating digital signal sampled at variable frequency.
- b. U.S. Patent No. 6,373,412 to Mitchell et al. disclose a fast JPEG Huffman encoding and decoding.
- c. U.S. Patent No. 6,754,383 to Payton discloses a lossy JPEG compression/reconstruction using principal components transformation.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chat C. Do whose telephone number is (703) 305-5655. The examiner can normally be reached on M => F from 7:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chaki Kakali can be reached on (703) 305-9662. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chat C. Do
Examiner
Art Unit 2124

October 12, 2004


ANIL KHATRI
PRIMARY EXAMINER